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(पंगसियनोडोन हाइपोफथाल्मस)

Requirements for Good
Aquaculture Practices —
India GAqP Striped Catfish
(*Pangasianodon hypophthalmus*)

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FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fish, Fisheries and Aquaculture Sectional Committee had been approved by the Food and Agriculture Division Council.

Considerable milestones have been reached in productivity of aquaculture products in the country. Concerns about food safety and quality, sustainability, environmental protection, worker safety and welfare have also gained importance. Thus, it is desirable to set up control and compliance systems for various kinds of aquaculture produce. In this context, it is necessary to pay attention to the quality of production practices requiring minute attention at different aspects of production, storage, handling and distribution.

In India, aquaculture practices are highly localized occupations and display a lot of variability in cultural practices and varietal preferences across regions. Further, with the opening up of the world market, there is a flow of trade in the aquaculture products. It is, therefore, necessary to define and assign certain common minimum standards to facilitate trade in these products and to win the confidence of the consumers within the country and outside.

Such standards envisaging focused approach for implementing good aquaculture practices, traceability etc. through appropriate infrastructure, record keeping and monitoring would reap following broad benefits:

- a) Development of basic infrastructure at the field level,
- b) Build up culture for good aquaculture practices by the farmers,
- c) Uniform approach across farms regardless of their sizes,
- d) Increased awareness among the producers, as well as the consumers about the need for consumption of good quality and safe food,
- e) Traceability through complete integration of food chain,
- f) Improvement in the environment,
- g) Worker safety and welfare.
- h) Reputation in the international market as a producer of good quality and safe produce, and
- j) Overcoming the technical barriers to trade (TBTs).

This Standard is part of a series of Indian Standards on Good Aquaculture Practices under development.

The composition of the Committee, responsible for the formulation of this standard is given at Annex B.

In formulation of this standard, considerable assistance has been provided by Indian Council of Agricultural Research - Central Institute of Freshwater Aquaculture, Bhubaneswar (ICAR-CIFA). Contribution of Dr. S. K. Sahoo, Principal Scientist, (ICAR-CIFA) is also duly acknowledged.

Indian Standard

REQUIREMENTS FOR GOOD AQUACULTURE PRACTICES — INDIA GAqP STRIPED CATFISH (*PANGASIANODON HYPOPHthalmus*)

1 SCOPE

This Indian Standard covers the control points and compliance criteria necessary to be followed by the producers (individual producers and/or members of a producer group) of *Pangasianodon hypophthalmus* (striped catfish). This standard applies to the good aquaculture practices (GAP) to be followed at all stages of the production of this catfish in freshwater pond including practices followed for stocking, pond management, harvesting and post-harvest handlings prior to transportation to market.

2 TERMINOLOGY

For the purpose of this standard, the following terminologies shall apply:

2.1 Good Aquaculture Practices (GAqP) — Practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food aquaculture products.

2.2 Applicant Producer/Producer Group — Individual/organization that has applied for certification to India GAqP certification body.

2.3 Hazard — A biological, chemical, physical agent in, or condition of, with the potential to cause an adverse health effect.

2.4 Individual Producer — A person/organization legally responsible for on farm production, who retains ownership of all the produce covered in the India GAqP licence.

2.5 Inspection — An examination of all aquaculture practices in order to verify compliance to requirements specified in this standard.

2.6 Record — Document showing objective evidence of the tasks performed and results achieved.

2.7 Self-inspection — Internal inspection of the registered product carried out by the grower on his/her farm using control points and compliance criteria.

2.8 Traceability — The ability to trace the history, use or location of a product (that is, the origin of materials

and parts, processes applied to the product, or its distribution and placement after delivery) by means of a record.

2.9 Catfish — The fish without scale and bearing barbels.

2.10 Worker — Any person on the farm who has been contracted to carry out a task. This includes farm owners and managers.

2.11 Producer Group — A recognized group of producers applying for certification with an internal procedure and internal control of all the members registered to the India GAqP requirements, and complying the requirements as specified in this standard.

2.12 Field — Separate unit of land within a farm.

2.13 Farm — A farm is an agricultural production unit or group of agricultural production units, covered by same operational procedures, farm management.

2.14 Environment — Surroundings in which an activity takes place including air, water, land, natural resources, flora, fauna, humans, and their interrelation.

2.15 Customer — A customer is anyone who purchases products or services from a supplier.

2.16 Certification — All actions leading to the issuance of an India GAqP licence.

2.17 Standard Operating Procedure — A written document which details an operation, analysis, or action whose mechanisms are prescribed thoroughly and which is commonly accepted as the method for performing certain routine or repetitive tasks.

2.18 Major Requirement — The mandatory requirement that shall be fully complied with. In case of non-compliance, it will seriously affect the quality of freshwater aquatic animal as well as safety of consumers. It means that the requirement shall be complied with relevant laws and regulations as well.

2.19 Minor Requirement — The requirement that shall be mostly complied with. In case of non-compliance, it

will affect the health of freshwater aquatic animal or product quality.

2.20 Veterinary Drug —Any substance applied or administered to any food-producing animal, whether used for therapeutic, prophylactic, or diagnostic purposes or for modification of physiological functions or behaviour.

3 CONTROL POINTS AND COMPLIANCE CRITERIA

3.1 Control points and compliance criteria required to be followed by the applicant producer (individual producer and/or member of a producer group) as well as by the certification body for independent verification of the aquaculture practices that have gone into the production of the produce are given in Table 1. In addition, the applicant producer (individual producer and/or member of a producer group) shall demonstrate compliance with all applicable statutory and regulatory requirements.

NOTE — The standards given in Annex A may be read to facilitate the implementation of this standard and are for guidance purpose.

3.2 These criteria are marked as ‘Major’, ‘Minor’ or ‘Reco’. The criteria marked as ‘Major’ have a definite effect on the safety and quality of the produce and shall, therefore, be complied with, or shall give adequate assurance about the safety and quality of the produce. The criteria marked as ‘Minor’, though have a bearing

on quality, are those which, if implemented, would provide an advantage to the assessment for India GAqP certification. The criteria marked as ‘Reco’, are those, which though may not have direct bearing on safety and quality of produce but may have other benefits to the producer and are recommended for implementation and are advisory in nature.

3.3 For the purpose of verification, a grading pattern given below shall be followed for grant of India GAqP licence:

<i>Category of Licence</i>	<i>Compliance of Major Requirements (in Percent)</i>	<i>Compliance of Minor Requirements (in Percent)</i>
India GAqP — A	100	90
India GAqP — B	100	80
India GAqP — C	100	75

4 BIS INDIA GAQP CERTIFICATION

BIS India GAqP certification shall be as prescribed under the provisions of *Bureau of Indian Standards Act, 2016* and Rules and Regulations framed thereunder. The details of the conditions under which the licence may be granted to producer (individual producer and/or member of a producer group) may be obtained from the Bureau of Indian Standards.

Table 1 Control Points and Compliance Criteria
(Clause 3.1)

Sl No.	Item	Level	Requirements	Compliance Criteria
1	LOCATION AND LAYOUT OF FISH FARM, SITE RECORD AND TRACEABILITY			
1.1	Identification and traceability	Major	India GAqP registered produce shall be traceable back or trackable from the registered farm or other relevant registered areas, where it has been produced.	1. Ascertain that each registered grower, society, farm and the produce has been given a code number. Simultaneously a package of practice must be followed for accurate trace-back of the produce. 2. Verify that there is a documented identification and traceability system that allows IndiaGAqP registered product to be traced back to the registered farm or, in a farmer group, to the registered farms of the group, and tracked forward to the immediate customer. Harvest information shall link a batch to the production records or the farms of specific producers. Produce handling shall also be covered, if applicable. NOTE — The first traceability starts with the registration/identification number given to the farm. Next traceability is plot and batch identification.
1.2	Farm location	Minor	Survey No./Part-Survey No., village, tehsil, district, state where the farm is located along with total area under cultivation and the area under India GAqP certification shall be specified.	Verification of complete area of the farm complying with the records.
1.3	Farm layout	Minor	Fields/plots and structures shall be identified on the layout map of the farm.	Verification of the pond position and other infrastructures are to be made for their correctness as per the layout of the farm.
		Minor	Availability of good water supply, inlet and outlet system.	Visual inspection of the design of water inlet and outlet system for the water supply and drainage among the ponds to prevent cross contamination.
1.4	Vicinity of production area to potential risk source	Minor	Vicinity of farm with reference to chemical or other industries, saline regime, agriculture fields, rivers, other water sources, hill rocks, and reclaimed land shall be specified.	1. Find out the micro-climate of the area which affects the productivity, safety and quality of the aquaculture product. 2. Verify measures taken to minimize contamination or loss.
1.5	Access to the farm	Minor	Convenient access to the farm from both outside and inside for easy farm operation and transportation of the inputs and produce.	Visual inspection and suggestion.
2	SOIL AND WATER MANAGEMENT			
2.1	Soil Mapping	Minor	Land should be classified based on topography, texture and structure of soil, gradient, surroundings, etc. Soil maps should be prepared for the farm.	1. Verify that class of land has been decided based on prevailing land capability classification systems of the appropriate authority. 2. Verify that the type of soil is identified for each site based on a soil profile or soil analysis or local (regional) cartographic soil type map 3. Verify that the analysis is carried out for the soil from actual depth of interest for farming the targeted species.

Table 1 (Continued)

Sl No.	Item	Level	Requirements	Compliance Criteria
2.2	Soil Health	Minor	Soil health shall be determined based on physical and chemical composition and soil profiling	Verify that the soil is ideally suited for the species, based on soil reaction (Electrical conductivity, pH), soil nutrient status, etc. Refer soil analysis reports.
2.3	Water source	Major	Water source can be surface water or ground water, and the source need to be identified	1. Verify that the water from source is free from any pollutants (pesticides, heavy metals). 2. Verify that the water supply and drainage are two separate system in the farm to avoid cross contamination
2.4	Water quality	Minor	Water quality shall be determined based on standard chemical analysis	Verify that the water quality is suitable or is being monitored to provide ideal growing environment for the proposed species
2.5	Waste water drainage	Minor	Effluent disposal should comply with relevant laws and regulations	1. Verify that the effluent water is treated through treatment plant before release to the environment 2. Verify the quality of treated water before disposal
3	GROWER RECORD			
3.1	Type of farming	Reco	Records relevant for the type of farming (co-operative, contract, lease farming, individual farmer, group farming/ public/ Governmental agencies) should be maintained	Verify the type of aquaculture activities and relevant records
3.2	Farm management capability	Reco	Grower's accomplish-ment in catfish farming, technical back ground in aquaculture, skills acquired and knowledge support available shall be documented.	1. Verify that farmer or the farm manager is well versed in aquaculture and specially on catfish farming through formal education, skill development training or experience 2. Verify, if the farmer is getting technical know-how from Government or any other competent organization or individuals
3.3	Maintenance of records	Minor	Records on types of culture system, cultivated species and stocking density shall be maintained	1. Verify that records are maintained for the species cultured in the particular system for the current and previous growing seasons and for a minimum period of six months for new applicants. 2. Verify that records are maintained for crop history of particular plots
3.4	Retention period of records	Reco	All records requested during the inspection shall be accessible and shall be kept for a minimum period of two years	Verify that the producers keep up to date records for a minimum of two years from the date of previous inspection
3.5	Internal Evaluation	Minor	The farmer/society/ co-operative body shall undertake internal self-inspection on scheduling of crop production practices and shall exercise necessary supervision in their adoption	Verify that self-evaluation based on applicable criteria is conducted annually or seasonally during crop duration
3.6	Corrective Actions	Major	Effective corrective actions shall be taken as a result of internal self-inspections.	Verify, validate, implement and check documentation of all corrective actions

Table 1 (Continued)

Sl No.	Item	Level	Requirements	Compliance Criteria
4	CULTURE SPECIES AND SYSTEM			
4.1	Culture System	Reco	The culture system needs to be specified	1. Verify that the culture system is specified 2. Verify that the practitioner has basic knowledge and acquired skill to operate in the culture system
4.2	Culture practice	Major	Culture practice followed need to be recorded	Verify that the practitioner is trained/acquired knowledge and skill on the culture practice
4.3	Grow-out system	Reco	Technology recommended by State Agriculture Universities (SAUs)/ National Research Institutes/ other Govt. Organizations/ Govt. approved organizations shall be used	Verify that the technology recommended by State Agriculture Universities (SAUs)/National Research Institutes/other Government organizations/ Government approved organizations shall be used
5	GROW-OUT CULTURE PRACTICES			
5.1	Pre-Stocking Pond Preparation			
5.1.1	Preparation of dry and seasonal pond	Major	Pond preparation to be done following suitable protocol of liming and other chemicals.	1. Verify that pond preparation carried out with appropriate dosages of organic manures and lime. 2. Verify from record if any unscrupulous chemicals having long retention period and ill effect on the food chain are used during pond preparation
5.1.2	Preparation of perennial pond	Major	Pond preparation to be done following suitable protocol of weed clearance, liming etc.	1. Verify that pond preparation carried out with prescribed use of lime and other chemical fertilizers as per the source technology. 2. Verify that unscrupulous chemicals having long retention period and ill effect on the food chain are not used during pond preparation
6	SEED SOURCING			
6.1	Traceability of Seeds	Major	Seed procured from a reputed/certified hatchery shall be used	Verify that the seed used is procured from a reputed/ certified hatchery and record is maintained on the procurement date and batch of seed production
6.2	Quality of seeds	Major	The seeds shall be active and apparently healthy, free from known major diseases of the cultivated species.	1. Verify claim on seed, regarding size and freedom from known diseases endemic to the area. 2. Verify that necessary documentation is maintained on verification of the claim
6.3	Seed transport	Reco	Seed should be transported in hygienic conditions and with minimum stress. Standard protocol for seed transportation should be followed.	Verify that the seed has been transported in hygienic conditions and with minimum stress to the animals
7	STOCKING			
7.1	Stocking size	Minor	Stocking size should not be less than fingerling or juveniles depending on the duration of culture and targeted production.	Verify from the records that fingerling or juveniles are only stocked to achieve the desired final size in pre-define culture duration
7.2	Acclimatization	Minor	Seed to be acclimatized to the new pond environment prior to release	Verify that proper seed acclimatization done prior to release to ensure higher survivability.

Table 1 (Continued)

Sl No.	Item	Level	Requirements	Compliance Criteria
7.3	Density and species ratio (in case of polyculture)	Minor	Stocking density of the species need to comply with the recommendation of the source of technology.	Verify that stocking density complies to the targeted production.
8	POST-STOCKING POND MANAGEMENT			
8.1	Manuring or fertilization	Minor	Water quality should be maintained with interim application of lime or other chemical. Manuring must be stopped 15 days before harvest.	Verify from record that only recommended lime and other chemicals are used in prescribed dosage to maintain the water quality
8.2	Supplementary feed and feeding	Minor	Type of feed is selected based on nutritional requirement. Feed should be farm-made or sourced from a reputed company. farm-made or sourced from a reputed company.	1. Verify the nutritional claim of the feed. 2. Verify that the forms (semi-floating and floating) and size of the feed pellet suits to the feeding behaviour 3. Verify from record that daily feed ration is tailored to meet the actual requirement of feed to minimize wastage of feed and pollution
8.3	Pond environment monitoring and management	Minor	Pond environment management is done following suitable protocols of liming or fertilization as per the need.	1. Verify that record is maintained on water quality parameters and corrective measures taken to maintain the water quality within tolerance range of striped catfish 2. Verify that pond environment management is done with appropriate protocol of interim liming or fertilization as per the source technology
8.4	Health management	Minor	Fishes should be periodically sampled for regular health check. In case of abnormal symptoms, management measures shall be considered prior to application of any therapeutics/veterinary drugs/chemicals.	1. Verify from daily record of farming activity on any disease incidence 2. Check if the abnormal condition can be normalized through management measures 3. Verify that effective preventive and prophylactic measures taken 4. Verify that un-scrupulous chemicals are not used to cure or curtail the disease incidence
8.5	Reporting of disease outbreak	Major	In case of disease outbreak, farmer shall immediately inform the nodal department.	1. Verify the record of water quality and feeding schedule. 2. Verify for any earlier similar disease incidence and corrective measures taken thereafter
8.6	Use of veterinary drugs and chemicals	Major	Use only permitted veterinary drugs and chemicals	1. Verify the application record of veterinary drugs and chemical undertaken as corrective measures of the disease incidence. 2. Verify the record of carcass characteristics and effluent water.
8.7	Harvesting	Minor	The harvesting should be well planned as per the demand	Verify from the records that harvesting was well planned and carried out in an organized manner
9	POST-HARVEST MANAGEMENT			
9.1	Cold Chain Transport			
9.1.1	Sorting and Grading	Reco	Harvested fishes are to be graded as per sizes.	Verify that harvested fishes are graded before sale to fetch size specific sale price.
9.1.2	Packing	Reco	Packing is done to maintain product quality.	1. Verify that the harvested fishes are properly packed to ensure better quality. 2. Verify that packing is done with approved packaging materials.

Table 1 (Continued)

Sl No.	Item	Level	Requirements	Compliance Criteria
9.1.3	Transport	Reco	Harvested fish to be transported to the market.	1. Verify that appropriate fish : ice ratio maintained in pack based on transport distance and duration to maintain product quality during short and long-term transportation in cold chain 2. Verify that no unscrupulous chemicals/antibiotic used during the packaging to extend the keeping quality
9.1.4	Product withdrawal and recall	Major	Procedures for product withdrawal	1. Verify that each product batch is given a number for tracing back in case of withdrawal 2. Verify that a procedure for withdrawing the product consignment is available. 3. Verify from record and interview with the workers regarding any history of product withdrawal in the farm
10.	BUILDING, EQUIPMENT AND OTHER INFRASTRUCTURE			
10.1	Storage facility for feed, feed ingredients, lime, fertilizers and other inputs	Minor	Farm should have well ventilated storage facility for feed to maintain the feed quality during storage. Farm should have suitable provision to keep other inputs in good condition	1. Visual inspection to verify that the store is clean, well ventilated and protected from moisture and has provision to store feed bags in stacks 2. Verify that the store is free from rodents. 3. Verify that the limes and other chemicals and fertilizers are of fresh stocks and are being stored
10.2	Store facility for farm implements	Minor	All the farm implements, equipment used for farm operation are properly maintained, clean and orderly placed, in hygienic manner in store,	Visual inspection
10.3	Maintenance/calibration protocol	Reco	Maintenance schedule/plan of farm machinery	1. Verify that the farm implements are maintained properly 2. Verify the record that all measuring implements such as balance, gadgets for water quality monitoring, etc. are calibrated periodically as per requirement
10.4	Office building	Reco	Well-equipped office and laboratory	1. verify the farm has a good laboratory for soil and water quality management 2. Visual observation of the office room for facility like discussion table and other accessories inside for record keeping and sitting
11	HYGIENE CONDITION IN IN FARM			
11.1	Discharge water from pond	Major	Treatment of discharge water in effluent treatment system (ETS) before release to the environment.	Verify that the farm should have a well-designed ETS to treat the discharge water before its release and this water should not contaminate the source water.
11.2	No discharge of domestic waste or animal house waste	Major	Farm should be free from receiving any household waste or waste or wash water from animal shed.	Only through visual inspection.
11.3	Toilet in farm	Major	Hygienically designed toilet should be located at safe distance from the pond to prevent possible sewage contamination.	Verify the location of the toilet and its storage chamber.

Table 1 (Concluded)

Sl No.	Item	Level	Requirements	Compliance Criteria
12	PERSONNEL HYGIENE AND WELFARE			
12.1	Personnel hygiene	Minor	All workers should be free from any contagious disease. This should be ensured through periodic health screening of workers.	Verify the records of medical examination and health screening of workers
12.2	Sanitary facilities	Minor	Avoidance of contamination from human source	Verify that proper facilities (hand washing, clean clothing, clean toilet) are available for the workers in the farm
12.3	Visitors	Reco	Only authorized access only in certain area after proper sanitary measures	Verify the facility that is used (clean clothing, using chlorinated water for washing feet, etc.) to avoid contamination from the visitor, especially in the hatchery system
12.4	Amenities	Reco	Designated and well maintained areas scaled as per the number of farm workers for sitting and dining	Visual inspection
13	TRAINING TO FARM PERSONNEL			
13.1	Training requirements	Reco	Assessment of training requirement for the personnel for fish farming and handling of farm implements	1. Verify from record that personnel have basic training on farming 2. Verify that the personnel have been given refresher course periodically on the recent techniques of carp farming and post-harvest handling
14	RECORD KEEPING			
14.1	Maintenance of record	Minor	All the major activities of the farm, records of employee, culture operation, input use, disease incidence, fish growth, harvest and sale records should be maintained.	Verify that all these records are maintained.

ANNEX A

(Clause 3.1)

A-1 GOOD AQUACULTURE PRACTICES FOR GROW-OUT PHASE OF STRIPED CATFISH

India is well established as a leading aquaculture producing country in Asia. Indian major carps contribute largely to the aquaculture production other than prawn and catfishes. Hence, India is the second largest fish producer of the world with its aquaculture production from the freshwater sector approximately exceeding 5.1 million tonnes during 2013-14 (Handbook on Fisheries Statistics, DAHD&F, 2014-15). The wide choice of fish for consumption by the consumers becomes instrumental for working on the diversification of species and system. Research results on the aquaculture of minor carps, medium carps, catfishes and air-breathing fishes has opened up the opportunity for larger adaptation of wide range of fish species by the fish farmers. One of the catfish, *Pangasinodon hypophthalmus* (striped catfish) recently introduced in India has taken acceleration in aquaculture due to its good growth and high density culture. If we see the world aquaculture scenario, only 72 species were farmed during 1950, which increased to 115 during 2006 (FAO, 2006, Bartley et al., 2009). The sutchi catfish production has achieved a space in the fish production scenario of the world due to the high production level in the basin of Mekong river. The farming of sutchi catfish has been growing over the past few years, which supports food security and income generation among the rural communities in Bangladesh. India has also witnessed similar trend of peak production of this catfish from aquaculture during 2010-11, even there is a considerable concern on its impact on biodiversity. This rapid higher production was suddenly felt somewhat unplanned, uncoordinated and unregulated, which was probably due to the policy decrees. Hence, the primary criteria like pond size, level of stocking, farm operation, water use/environment, food and feeding management, disease occurrence and marketing the production as per the need of domestic and foreign market are to be considered importantly to sustain the production.

A-2 POTENTIAL CHARACTERS OF THE SPECIES

- a) It has immense food value;
- b) It adapts well in freshwater and matured in captivity; and
- c) The catfish is having accessory respiratory organ, which helps it to survive in low oxygenated condition.

A-3 PROBABLE ISSUES

- a) High fish production compared to the low demand;
- b) Low farm gate price due to low market value as observed during 2010-11 in

Andhra Pradesh;

- c) Poor disease surveillance and disease management;
- d) Lack of entrepreneurship approach;
- e) Conversion of agricultural land to ponds;
- f) Water pollution resulting from pond effluents;
- g) Excessive use of ground water and other freshwater supplies for filling ponds;
- h) Excessive use of drugs, antibiotics, and other chemicals for aquatic animal disease control;
- j) Negative effects on biodiversity due to escape of non-native species illegally introduced for aquaculture;
- k) Spread of aquatic animal diseases from culture of organisms to native populations; and
- m) Irrational use of feed and feed ingredients.

Such issues and constraints should be resolved on a continuous and priority basis to maintain the pace of the development in the coming years.

A-4 NECESSITY OF GAQPS IN SUTCHI AQUACULTURE

Responsible management practices could avoid or reduce the negative impacts in pond environment for sustainable Sutchi production. The Good Management Practices (GAQP) is adopted to improve the farming at a given time for efficient and optimized resource utilization, improved growth, higher productivity, production of quality fish and with good pond environment during its aquaculture.

A-4.1 The Pond

Earthen ponds are more preferred for the aquaculture of the catfish. The pond should bear more soil percent to reduce the seepage loss. The height of pond dyke must be maintained higher than the normal condition to restrict the fish from escapement as it is an exotic fish to restrict the impact on biodiversity. The opened part of the pond must be provided with creepers to reduce the soil erosion of the dyke. The water inlet and outlet must be provided for the easy working in future with a slight slope to one end for complete drainage at the necessity.

Usually <5 ha ponds are seen in Asian countries for the grow-out culture of this catfish with 2-6 m water depth. However, a larger water body is necessary for its good growth. The ponds of small holdings to larger water body upto 3-5 ha areas are seen in India for its culture. However, bigger water body of 2-3 ha with 2-3 m depth may be useful for good growth as they need more space for their swimming activity. Further the population size may be manipulated during its production system.

A-4.2 Pre-stocking Pond Preparation

The pond bottom must be kept dry and cleaned before use. In case of second crop, sediment of the previous crop should be scrapped in case of new pond or muk removal of old pond must be carried out after proper drying of the bottom. It is better not to pile the removed sediment on the pond dyke. However, soil pH plays an important role on pond productivity and environment. The ponds bearing pH of slight above neutral range do not pose much problem on the growth of fish or fish production. Ponds in acid sulphate region or acidic soil pose more problem during fish culture. A standard method/dose of quick lime treatment with frequent water flush may rectify the problem. The dose of quick lime may be referred as literature published (Gupta et al., 1997). The perennial ponds must be free from weed/predatory or weed fishes before stocking the seed. This activity may be undertaken with the standard procedure like manual/ chemical/ biological method as published for carp species.

A-4.3 Seed Stocking

The stocking density in catfish is determined as per the size of seed, types of production system, growing period, the investment capacity of the farmer, etc. High density culture of this species is observed in Mecong river basin. That situation is not prevailed in Indian Pangasid culture. However, government of India has recommended 20,000/ha density for the Indian scenario with a maximum production target of 20 t/ha/yr. But it is not followed properly and low or high stocking are observed among the farmers in India. As learned from the Pangasid culture in Asian countries, it is desired to stock juveniles of 50-100 g to achieve quick growth, low mortality and high production within the desired density as mentioned above. It was also observed multiple stocking/multiple harvesting of Pangasids in Cambodia/Vietnam like carp aquaculture in India. This activity results high production of Pangasid. But it may not be desired in Pangasid culture in India as learned lesson from the non-saling of excess production and their poor marketing in Andhra Pradesh during 2010-11. Hence, single stocking with planned way harvesting may lead to sustainable aquaculture of this species.

A-4.4 Post-stocking Management Measures

A-4.4.1 Supplementary Feeding

Cost of the supplementary feed with balanced nutrient forms the major investment for the grow out farming. The importance of feed management in pond culture is important as excess feeding is not only an economic loss, but also degrades the pond environment while underfeeding depresses growth. The feeding of 3-4 percent of body weight is usual in Pangasid culture. As the fish grow, the requirement of reduced feeding must be considered to curtail the cost of production. This Pangasid is a voracious feeder as seen from outside while feeding. But the fishes feed more than the requirement, which they vomit in subsequent period. Many commercial feeds are available for Pangasid culture in India in the form of semi-floating or floating in nature, which is to be distributed throughout the pond to give ample opportunity to all the survived fish.

A-4.4.2 Interim Activity

There is requirement of application of lime or chemicals to maintain the good environment. This Pangasid is an obligatory air-breather. Many times, the shortage of oxygen level (<4 ppm) in the environment is observed due to deterioration of water quality or high density culture. It is desired to use aeration device to saturate the oxygen level in the environment. Sometimes the water exchange from the cultured pond is required to keep the hygiene of the water environment as well as to enhance the product quality.

A-4.4.3 Health Management

Prevention has always been preferred over the treatment. Maintaining good water quality along with optimum feeding prevent most of the disease outbreak. Outbreak of disease in Indian Pangasid culture has not been observed. Certain diseases like Epizootic Ulcerative Syndrome (EUS), Argulosis, etc are very much common in aquaculture during the winter months for which we must be alert with suitable medicine like CIFAX (@ 1 liter/ha). Slow growth and reduced activeness of this catfish is also observed during the low water temperature.

A-4.4.4 Harvesting

Good marketing of Pangasid is observed when the fish reaches 1 kg and beyond. Repeated netting with minimum handling during harvest must be followed. The harvested fish must be stored in chilled water before ice packing to maintain the quality of fish. Further planning must be made during harvesting for the harvest of desired quantity.

ANNEX B*(Foreword)***COMMITTEE COMPOSITION**

Fish, Fisheries and Aquaculture Sectional Committee, FAD 12

<i>Organization</i>	<i>Representative(s)</i>
Indian Council of Agricultural Research, New Delhi	DR JOYKRUSHNA JENA, (<i>Chairperson</i>)
Central Inland Fisheries Research Institute, Barrackpore	DR BIJAY KUMAR BEHERA SHRI DHARMENDRA KUMAR MEENA (<i>Alternate</i>)
Central Institute of Brackish Water Aquaculture, Chennai	DR K. AMBASANKAR DR SUBHENDU KUMAR OTTA (<i>Alternate</i>)
Central Institute of Fisheries Education, Mumbai	DR GOPAL KRISHNA DR B. B. NAYAK (<i>Alternate</i>)
Central Institute of Fisheries Technology (CIFT), Cochin	DR K. ASHOK KUMAR DR MADHUSUDANA RAO (<i>Alternate</i>)
Central Institute of Fresh Water Aquaculture, Bhubaneswar	DR KEDAR NATH MOHANTA DR P. C. DAS (<i>Alternate</i>)
Central Marine Fisheries Research Institute, Kochi	DR A. K. ABDUL NAZAR
Coastal Aquaculture Authority, Chennai	PROF R. JAYARAMAN SHRI S. MANI (<i>Alternate</i>)
Defence Food Research Laboratory, Mysore	DR N. GOPALAN
Export Inspection Council of India, New Delhi	SHRI R. M. MANDALIK
Fisheries Division, DAHD&F, Min. of Agriculture, GoI, New Delhi	SHRI PAUL PANDIAN SHRI I. A. SIDDIQUI (<i>Alternate</i>)
Food Safety and Standards Authority of India, New Delhi	MS VINITA VERMA DR RAJESH KUMAR (<i>Alternate</i>)
National Fisheries Development Board, Hyderabad	EXECUTIVE DIRECTOR (TECHNICAL)
National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT), Cochin	SHRI VARGHESE JOHN MR KAMAL RAJ (<i>Alternate</i>)
Sea Food Exporters Association of India, Alleppy	SHRI NORBERT KARIKKASSERY
Society of Aquaculture Professionals, Chennai	PRESIDENT
The Marine Products Export Development Authority (MPEDA), Kochi	JOINT DIRECTOR DEPUTY DIRECTOR (QC) (<i>Alternate</i>)
Kerala University of Fisheries and Ocean Studies, Kochi	DR T. V. SANKAR
All India Shrimp Hatchery Association	SHRI D. RAMRAJ SHRI K. MADHUSUDAN REDDY (<i>Alternate</i>)
Director General, BIS (<i>Ex-officio Member</i>)	SHRI P. RAJESH, HEAD (FOOD AND AGRICULTURE DEPARTMENT)

Member Secretary

MS NAVITA YADAV

SCIENTIST 'C' (FOOD AND AGRICULTURE DEPARTMENT), BIS

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